DOCUMENT RESUME

ED 267 050 SP 027 332

AUTHOR Murphy, Linda B., Ed; Warger, Cynthia L., Ed.
TITLE Microcomputers and Teacher Education. OATE-OACTE Monograph Series No. 10.
INSTITUTION Ohio Coalition of Teacher Education Organizations.; Toledo Univ., Ohio. Coll. of Education and Allied Professions.
PUB DATE 85
NOTE 39p.; Printed on colored paper.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Computer Literacy; Higher Education; *Microcomputers; *Preservice Teacher Education; *Program Development

ABSTRACT

The six articles presented in this monograph discuss the role of microcomputers in teacher education: (1) "What Teachers and Their Students Should Know about Microcomputers" (Michael T. Battista) (2) "Promoting 'Computing Literacy' for Teacher Educators" (Keith E. Bernhard); (3) "Microcomputers in Education: A Review of Research" (Lynn Lehner and Collin A. Myers); (4) "The Diagnostic Profile: Using Microcomputers for Student Teacher Supervision" (Loviah E. Aldinger and Karen H. Guthrie); (5) "Helping Practitioners Utilize Microcomputers: The Bowling Green State University Example" (Charlotte Scherer); and (6) "Becoming Computer Literate: Practical Suggestions for Teacher Educators" (Gene R. Cupp). (JD)

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MICROCOMPUTERS AND TEACHER EDUCATION

ED267050

OATE-OACTE MONOGRAPH
SERIES NO. 10

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MICROCOMPUTERS AND TEACHER EDUCATION

Co-Editors
Linda Murphy
Cynthia Warger

Production and dissemination of this issue of the OATE-OACTE Monograph was jointly supported by the Ohio Coalition of Teacher Education Organizations and The University of Toledo, College of Education and Allied Professions. The content of this publication expresses the views of the authors and does not necessarily reflect the positions, policies nor the endorsement of its sponsors.

Toledo, Ohio
1985

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INTRODUCTION

As microcomputer usage has expanded in colleges of education, teacher educators have assumed a diversity of leadership roles. Some have investigated the theoretical underpinnings of microcomputer technology. Drs. Battista and Bernhard have applied their expertise to defining microcomputer literacy. Both authors assume that an established knowledge base is essential if teacher educators are to establish meaningful and long standing advances in the educational use of microcomputers.

Building upon the research, Lehner and Myers have examined research issues relative to computer-assisted-instruction. Their work indicates that teacher educators must continue to develop a research base to support the implementation of microcomputers in education.

Other teacher educators have pursued more pragmatic approaches. Drs. Aldinger and Guthrie have developed a computerized diagnostic profile for use in preservice field experiences. Their software can support both supervisory and administrative functions in teacher education.

Other teacher educators have contributed to staff development by implementing ways to better disseminate microcomputer findings. Dr. Scherer provides an example of how teacher educators can provide public schools with microcomputer information. Dr. Cupp emphasizes the importance to the staff development by providing suggestions for teacher educators who desire to become microcomputer literate.

Each article reflects a different facet of microcomputer usage in teacher education. Each demonstrates that teacher educators are becoming leaders in microcomputer technology.

Linda B. Murphy
Cynthia L. Warger

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WHAT TEACHERS AND THEIR STUDENTS SHOULD KNOW ABOUT MICROCOMPUTERS

Michael T. Battista
Kent State University

Abstract

Microcomputer literacy has become a legitimate instructional goal for schools. Thus, there is a need not only for teachers to become computer literate and to learn how to effectively utilize microcomputers to aid and enhance instruction, but for school systems to develop computer literacy curricula. This article describes how these interrelated needs can be fulfilled.

Knowledge about microcomputers has become a legitimate educational goal. Indeed, the National Council of Supervisors of Mathematics (1978) listed computer literacy as one of the ten basic skill areas in mathematics. The National Council of Teachers of Mathematics (1980) recommended that "a computer literacy course, familiarizing the student with the role and impact of the computer, should be a part of the education of every student." Moreover, the National Commission on Excellence in Education (1983) labeled computer science as one of the "Five New Basics" that should be required for high school graduation. Thus, there is a clear and urgent need not only for all teachers to become computer literate and to learn how to effectively utilize computers to aid and enhance instruction, but also for school systems to develop well-formulated computer literacy curricula for students. The purpose of this article is to discuss how these interrelated needs can be met.

A Survey of Definitions

Although many educators agree that high school graduates should be computer literate, there seems to be little agreement as to what the term "computer literacy" means. Many educators have taken a broad, comprehensive view of computer literacy. For instance, Moursund (1975), has defined computer literacy as knowledge of the non-technical and low-technical aspects of the capabilities and limitations of computers, and of the social, vocational, and educational implications of computer use. Anderson, Klassen, and Johnson (1981) have developed a similar definition of computer literacy that requires knowledge of the following areas: computer hardware; computer programming and algorithms; com-

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puter software and data processing; applications of computers; the impact of computers on society; and user attitudes, values and motivation.

An alternate definition of computer literacy is given by Luehrmann (1981) who defines computer literacy as "the ability to do computing." He contends that definitions which merely require students to recognize, identify, or become aware of alleged facts about computers are insufficient. Students should be required to actually *do* more than what can be attained after a few hours of hands-on computer experience.

Which of these definitions should be used for developing a microcomputer curriculum for the schools? Although each definition has merit, optimally a definition should incorporate elements of them all. While it certainly is important for students to have favorable attitudes towards microcomputers, and to have knowledge of their uses, it is equally important for students to be able to utilize microcomputers in their daily lives. Students not only should be able to intelligently evaluate the current uses of microcomputers, they also should be capable of utilizing the technology for such tasks as word processing, record keeping, information retrieval, data management, numerical computations and projections, statistical analysis, and computer assisted learning. That is, students should be able to utilize the many applications of microcomputers whether or not they are knowledgeable about programming, for it is these applications that the students are most likely to encounter as adults.

Therefore, it is proposed that the following "compromise" definition of computer literacy be used when developing a school-based microcomputer literacy curriculum:

> Computer literacy consists of favorable attitudes toward computers, knowledge of what computers can do, knowledge of how computers are used in society, knowledge of the consequences of computerization, and the ability to utilize the computer as a tool in daily life.

Although this definition of computer literacy does not describe detailed instructional objectives, it does provide some direction for constructing a computer literacy curriculum. The definition assumes that equal emphasis be placed on knowing about computers and being able to use computers.

It also assumes that merely having students gain hands-on experience with computers will not make them computer literate. Indeed, there is evidence indicating that many students who have taken a course on microcomputer programming have misconceptions about the nature of microcomputers and their uses (Anderson, Klassen, and Johnson, 1981; Battista, 1981). Thus, if students are to understand the nature and uses of microcomputers, then they must be taught this knowledge. And if students are to be able to utilize microcomputers in their daily lives, then they must be given experience with those uses.

Developing Appropriate Curriculum

All students should be required to take a one semester computer literacy course covering the knowledge and skills described in the above definition, preferably by their freshman year in high school. Course discussions should center on such topics as the history of computing devices, the electronic nature of computers, how computers are used in society, and ethical issues related to computer use. The course should provide students with hands on experience programming, word processing, using electronic spreadsheets, and managing data bases.

However, this course should neither be the beginning nor the end of a student's computer education. Prior to taking a computer literacy course, elementary students can be exposed to computer based instruction and fundamental computer programming. After students have taken the computer literacy course, additional computer knowledge and skills that are important in specific subject areas can be taught by teachers in specialty area courses. Also, since computer programming can be used to enhance learning in many subject areas such as college preparatory mathematics and science, and since computer programming probably will be required in most college programs, it would be reasonable to require that all college-bound high school students take additional courses in such areas as computer programming.

What Teachers Should Know About Computers

Teachers must become computer literate. Since it is anticipated that students will encounter microcomputers in many of their classes, teachers should act as role models in their use of computers. For instance, teachers could set good examples for students and save themselves considerable time by taking advantage of the computer's capability to help them with many noninstructional tasks such as grading, recordkeeping, and correspondence.

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If teachers are to *effectively* utilize the microcomputer as an instructional tool, they also must be familiar with the different types of software available for their teaching area. They must know how to evaluate, select, and obtain appropriate software. Merely having students interact with a simulation is not enough: Units of study based on such simulations must be designed to ensure that participating students gain the intended knowledge and understanding.

Further, teachers must know how to utilize the microcomputer's capabilities to enhance student learning in the particular subject area specialization. For example, mathematics teachers should be familiar with programming, function graphing programs, programs for solving equations and doing calculus numerically, electronic spreadsheets, and ways that computers can be used in probability and statistics. Industrial arts teachers should be familiar with how computers are used to control machinery, and biology teachers should be familiar with using computers to take physiological measurements such as response time, skin temperature, respiration rate, and heart rate. Knowledge of word processing is a must for English and business education teachers, as is electronic card catalogs and computer literature search mechanisms for librarians.

Concluding Remarks

If teacher educators are to prepare teachers adequately, then they, too, must be computer literate. They must be able to use computers to assist and enhance instruction, and they must respond appropriately to the inevitable changes in curricula that will come about with the increasingly widespread availability of microcomputers in the schools. The first step in the process is to systematically define computer literacy, so that curricula and training programs have a solid foundation. As was shown in this paper, there are basic components which must be included in any definition of microcomputer literacy.

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Dr. Battista is Assistant Professor of Education at Kent State University.

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PROMOTING "COMPUTING LITERACY" FOR TEACHER EDUCATORS

Keith E. Bernhard, Ph.D.
Bowling Green State University

Abstract

In recent years, increasing numbers of teacher educators have become "computing literate". At the same time, computer hardware and software have become more capable and less expensive. This article explores how teacher educators might use microcomputers in various work functions.

Move the clock back five years. The microcomputer is still a new "gadget". The IBM personal computer hasn't been invented yet; when it arrives in August 1981, it will have 16K of memory. Most people don't know what "K" is. Typical microcomputer users are educators who introduce the machines to their students by requiring them to master a language called the Beginner's Symbolic Instruction Code -- BASIC for short. Some students do well; others don't. There's talk about "computerphobia" and about how girls will never be as proficient in using computers as their male counterparts.

The contrast with events today is staggering. The memory capacity of microcomputers has improved considerably. The Apple IIc portable microcomputer has 128K; and the IBM-PC and Apple MacIntosh manage over 512K. The Apple Lisa had 1 Megabyte (one *million* letters, numbers, or symbols) of internal memory. Microcomputer software has multiplied both in numbers and sophistication; microcomputer hardware has become more capable and less expensive. Consequently, educators must now develop a broad set of useful computing skills that serve four functions: instructional support; administration; direct instruction; and professional development. This paper identifies which computing activities are included in each function and their relative importance. It then suggests ways those functions can be addressed in university courses and inservice workshops.

Types of Functions

For most educators, the important feature of a microcomputer is not the hardware, but the software. When determining what "computing literacy" is, it is crucial to ask which *functions* are to be performed by "computing literate" people. Given the sophisticated types of software that are available

today (e.g., spreadsheets with graphics capabilities; relational data base management systems; word processing programs that also can communicate with other computers via telephone lines), the challenge is to identify those functions which educators could perform with computers. Once identified, these functions can be matched to the available computing resources (e.g., software, special hardware, other services).

Four general categories or sets of functions are performed by educators. By analyzing these, the types of computer software and related resources that will be most useful for educators can be identified.

Instructional support function. Educators undertake instructional support functions when preparing, planning, and evaluating programs. Examples of activities in this category include: developing and updating instructional plans; scheduling instructional activities and projects; selecting, adapting, and developing instructional materials; maintaining files regarding instructional materials, activities, and teaching techniques; and evaluating the success of instructional materials, activities, and teaching techniques.

Administrative functions. The purpose of administrative functions is to maintain long-term records and provide accountability. Examples of activities in this category include: maintaining records on student performance; monitoring inventories and ordering materials and services, as needed; scheduling activities and projects; preparing reports to administrators and others (e.g., parents); and coordinating professional activities.

Direct instruction functions. The provision of direct instruction is another function. Examples of activities in this category include: presenting information to be learned; arranging circumstances for students to respond to problem-solving situations; providing practice (e.g., in the use of information or techniques); and providing feedback to students.

Professional development functions. The final category is professional development functions. Examples of activities in this category include: research studies on a variety of education-related concerns (e.g., learning; instructional design; teaching; classroom management; administrative practices; research methods; presented papers on selected topics; and curriculum development projects).

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The Place of "Utility" Software in the Four Categories of Educators' Functions

Some of the most useful software for educators are called "utility" software. Examples of utility software include word processing, electronic spreadsheets, materials development, data base management, project planning, communications, and statistical analysis.

To ascertain the scope of what can be accomplished when using microcomputers for educational purposes, the four functions and the types of utility software can be configured as a matrix. In Table I, the utility software that is easiest to use is listed first, followed by progressively more sophisticated types. This arrangement also presages the sequence in which educators may become "computing literate" most easily. Generally, the sequence reflects a continuum from relatively concrete operations to highly formal (abstract) operations.

A major activity for teacher educators is the manipulation and storage of information. Therefore, the use of data base management software (DBMS) will be considered in depth. Data base management uses the power of a computer to store and sort information. Since educators gather and use information, DBMS can help educators become more efficient in their use of information in decision making. For example information does not need to be stored alphabetically on the microcomputer. A user can search and find information by virtually any scheme desired (e.g., by length; by color; by zip code), or, with many DBMS programs, by multiple criteria (e.g., males with special education experience who have requested an urban placement for student teaching).

Further, DBMS concepts can be applied to each of the four sets of educator functions previously described. Table II presents a list of suggested uses.

Although educators might use any one of four strategies (independent discovery learning; workshops; courses; organizational efforts which combine a variety of training efforts with incentives attached) to become "computing literate," it is important to relate them back to the types of functions that educators perform, and the types of uses to which computer technologies might be put. The matrix in Table III profiles the types of educator functions by the types of strategies that educators might use. The viability of a given strategy for developing "computing literacy" for a given type of function also is indicated.

Table I

Major Types of Utility Software Compared to Educator Functions

MAJOR TYPES OF UTILITY SOFTWARE	CATEGORIES OF EDUCATOR FUNCTIONS			
	Inst'l Support Functions	Admin Functions	Direct Instrn Functions	Prof'l Devpt Functions
Materials Development	***		***	
Spreadsheet Analysis		***	#	#
Word Processing	***	***	#	***
Communications	#	#	#	***
Project Planning/ Scheduling	***	***	#	***
Statistical Analysis	***	***	#	***
Data Base Management	***	***	#	***

*** = Vital application of this software
# = Potential application

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Table II

DBMS Applications for Teacher Educator Functions

DBMS Applications for Instructional Support Functions

Maintaining interrelated files of instructional objectives and test items (e.g., as compiled by the Instructional Objectives Exchange -- IOX);
Maintaining files of instructional materials (title, source, cost, relevance to selected objectives, etc.);
Maintaining files of lesson plans, content outlines, and topical presentations.

DBMS Applications for Administrative Functions

Maintaining records/charts of student performance (e.g., by objective, overall);
Maintaining files of instructional materials and supplies for inventory control;
Profiling the academic performance of students for administrative accountability;

DBMS Applications for Direct Instructional Functions

Presenting the use of categorization schemes in science (e.g., in geology, biology, astronomy);
Presenting the use of systematically collected data to help answer questions social studies (e.g., surveying people on selected issues and interpretting results, compiling data from objective observations (e.g., of traffic patterns at selected intersections) to provide the basis for policy decisions (e.g., whether to install a traffic signal));
Having students use an existing data base to determine a course of action (e.g., determine the overall specifications for a proposed school building in a fictitious community);
Use "password protection" and permit students to view a data base showing their academic performance record -- complete with supportive comments and recommendations from the instructor.

DBMS Applications for Professional Development Functions

Compile and analyse data on student performance in a variety of controlled learning situations;
Assemble a file of dated comments/observations on selected aspects of teaching, learning, and the profession;
Assemble profiles of texts and associated instructional materials matched to the goals and objectives of a curriculum development project.

Table III

Strategies for Becoming Computing Literate
According to Function

STRATEGIES FOR BECOMING COMPUTING LITERATE	CATEGORIES OF EDUCATOR FUNCTIONS			
	Inst'l Support Functions	Admin Functions	Direct Instrn Functions	Prof'l Devpt Functions
Discovery Learning	***		***	***
Attending Workshops	***	#	***	***
Attending Courses	***	***	#	***
Organizational Efforts	***	***	#	#

*** = Appropriate, viable strategy
# = Possible strategy

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Generally speaking, instructional support functions can be well served by any of the strategies described (and probably by combinations of these). Other functions can be supported to varying degrees by the different strategies. It also is important to note that no single strategy is best for developing "computing literacy" in all four functional areas. Thus, a variety of models should be tested for preservice and inservice education programs geared toward helping educators become "computing literate."

Conclusion

Microcomputer technologies have advanced rapidly, and the need for educators to become "computing literate" has intensified. Indeed, of any professional group, it is educators who will likely make the most extensive use of microcomputer technologies. But strategies to help educators become "computing literate" remain unclear. By using matrices to examine the impact that types of software (especially "utility" software) can have on the functions that educators perform, and by examining the strategies that may be most appropriate for developing "computing literacy" in those functions, models can be developed that will be effective in preparing both preservice and inservice educators to use these powerful technologies.

Dr. Bernhard is Associate Professor of Education and Director of the Educational Media Center of Bowling Green State University.

MICROCOMPUTERS IN EDUCATION: A REVIEW OF RESEARCH

Lynn Lehner, M.A.
Walsh College

Collin A. Myers, Ph.D.
Walsh College

Abstract

This paper is a review of the literature concerning computer-assisted instruction from 1980 to 1984. Discussion focuses on the efficacy of computer-assisted instruction in the school systems.

At present, microcomputers are penetrating virtually every aspect of society. Numerous possibilities exist for microcomputers to become extensions of the educational system (Fisher, 1983; Packard, 1984). In addition to numerous funded projects (Mitgang, 1983), many universities across the country are requiring students to *own* their own personal microcomputers (O'Driscoll, 1983). In all but two states, computer literacy for students will be required by 1986 (Hopping, 1983; Lough, 1983; State Happenings, 1983). Teacher educators must be knowledgeable about microcomputers if they are to prepare tomorrow's teachers effectively. The purpose of this paper is to examine several issues in computer-assisted instruction, as well as to summarize recent efficacy literature.

As computer-assisted instruction (CAI) is the most common method of microcomputer use in instructional settings (Dowling, 1982; Gleason, 1981; Luehrmann, 1984; Reetz, 1983; "Technology Gap", 1984), this review will be limited to that area. Scandura (1983) reports that in general, CAI software systems tend to fall into one of three nonexclusive categories: (1) drill and practice; (2) tutorial systems which are designed primarily to exercise previously-learned skills; and (3) simulation and educational modeling. This paper will discuss only drill and practice and tutorial learning.

Historical Context of CAI

Microcomputers have been used for CAI learning since the 1950's when Kinner's programmed instruction was combined with Pressey's teaching machines (Dence, 1980). During the 1960's, many research projects investigated the utility of microcomputers (Steele, Battista, & Crockover, 1983).

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By the early 1970's, interest in CAI dwindled (Dence, 1980; Harrod & Ruggles, 1983). The cost of computer equipment was too high for most elementary schools. More significant was the cost of courseware development. Although some courseware had impressive instructional results, most was inferior to conventional texts. Educators were forced either to utilize software which did not match their own approaches to learning or to abandon CAI altogether (Morris, 1983).

In the early 1970's, Papert developed, in addition to the computer language logo for elementary children, his Turtle CAI Project. While this program stimulated a rising interest in CAI, cost effectiveness still hampered large school public school adoption.

In spite of classroom teachers resistance to CAI, Suppes and Jerman (1969) developed a CAI tutorial system for math and language arts for both mainstream and culturally-disadvantaged students. Concurrently, another tutorial CAI system known as the Stanford Drill and Practice System was designed (Suppes and Macken, 1978). Other major systems developed at this time were the Individual Communication System and the PLATOS I, II, III, and IV systems whose goals were to utilize the computer for automating individualized instruction (Burns and Bozeman, 1981).

Gleason (1981) and Hamlet (1984) both assert that the cost reduction of microcomputer hardware in recent years has been a major factor in explaining school systems' mass purchasing. Spurred by the availability and great flexibility of microcomputers, educators are taking a renewed interest in CAI instruction (Steele, Battista, & Crockover, 1983).

In fact, Powers (1983) reports that teachers have been the driving force behind the adoption of microcomputers in many schools. Courseware is now beginning to address the full spectrum of knowledge, skills, and attitudes developed through school related topics and subject matter (Patton, 1984).

The Need for Research on CAI

Presently there are many questions as to whether the rapid wholesale move to CAI usage in public and private schools is born out of research. Unfortunately, research with regard to microcomputers is extremely limited (Bracey, 1982; Hunter, 1983). There is little research that evaluates whether or not teachers can identify CAI programs which "work best" (Bracey, 1982; Fisher, 1983; Packard, 1984).

Additionally, Golas (1983) stresses that there is a great need for formative evaluation to improve and strengthen CAI products already on the market. At present, there is no clear-cut evidence regarding what should be included in CAI programs, and if or how CAI can be used to help students learn more efficiently and effectively (Harrod & Ruggles, 1983). According to Daniels (1983), it is of utmost importance to determine whether or not the CAI programs currently in use actually improve instruction and learning.

Gleason (1981) states that current research tends to focus on the following topics: (a) effective CAI strategies; (b) how individual learning styles affect learning via CAI; (c) effects of CAI on individual learner characteristics such as memory span and perceptual skills; (d) affective characteristics of the learner; (e) effective strategies for CAI program development; and (f) strategies for integrating CAI with other instructional activities. While these are considered valid topics for investigative purposes, the present authors have narrowed the scope of the remaining literature review to the effectiveness of integrating CAI with other instructional activities.

Efficacy Studies: A Review of the Literature

Kulik, Bangert, and Williams (1983) have completed an analysis of research studies (n=51) completed since 1960 on students in secondary schools. The researchers eliminated 260 studies from their analysis due to "flaws in methodology" among other reasons. Their analysis shows that students who received CAI generally scored better on objective tests than students who received traditional instruction.

Additional research on the efficacy of CAI and mathematical learning was surveyed by Burns and Bozeman (1981). Using a meta-analysis procedure, results indicated that: (a) CAI was significantly more effective in fostering achievement; (b) CAI drill-and-practice was most effective with high achieving and disadvantaged elementary and high school students; (c) achievement of average level students was not significantly enhanced by drill-and-practice; (d) supplemental drill-and-practice was significantly more effective in stimulating achievement gains among intermediate grade boys.

Burns and Bozeman (1981), Bracey (1982), and Fisher (1983), all point out that no final answers related to CAI effectiveness or guarantees of success can be made. However, the analysis and synthesis of a number of studies suggests the possibility that CAI enhances learning, at least in the curricular area of mathematics. This assertion, however, contrasts with the results of Steele, Battista, and

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Crockover (1983) who found that even though scores on a computer literacy measurement could be significantly increased via a CAI math program, mathematical achievement was not.

In a related study, Orlansky and String (1983) reported that achievement with CAI was not significantly greater than conventional instruction in military training. However, as noted by Orlansky (1983), CAI permits students to proceed at their own pace, thereby increasing the probability that some students will acquire the information more quickly than others.

Conclusion

In light of the present research review, it is not surprising that only one in sixteen teachers actually use microcomputers for instructional purposes (NEA, 1983). Research literature is both supportive and nonsupportive. Moreover, nearly every reference reconfirmed the need for additional data. If the claim is to be made that students do learn more, retain more, and do so at a faster rate when using CAI programs, then it must be substantiated.

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Lynn Lehner is a special education teacher who completed her Master of Arts at Walsh College. Dr. Myers is Associate Professor and Chair of the Department of Special Education at Walsh College.

THE DIAGNOSTIC PROFILE: USING THE MICROCOMPUTER FOR STUDENT TEACHER SUPERVISION

Loviah E. Aldinger, Ph.D.
The University of Toledo

Karen H. Guthrie, Ph.D.
Frostburg State College

Abstract

A software program for the Apple II microcomputer, entitled the "Diagnostic Profile," scores and saves competency and attitudinal data for individual student teachers in the area of handicapped education. The profile generated by the software program can facilitate both administrative and supervisory functions related to student teaching.

The "Diagnostic Profile," a microcomputer software program developed at The University of Toledo, is designed to meet many of the administrative and supervisory needs of teacher educators[1]. The "Diagnostic Profile" enables a student teacher supervisor to use the microcomputer to store and process pre- and posttraining data concerning student teacher competencies and attitudes in the area of handicapped education. The supervisor also can enter baseline data for pupil learning or behavior problems identified by the student teacher in the field setting. The "Diagnostic Profile" scores and saves the data, and then provides a diagnostic profile on individual student teachers which can be generated at both the beginning and the end of the practicum. In this paper, the microcomputer program will be described, as will practical ways to utilize it.

Student Teacher Variables Used in the "Diagnostic Profile"

Student teacher data are entered directly into the microcomputer from competency, attitude, and pupil baseline instruments. These instruments and methods of data collection are described in the following sections.

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Competencies. During the first two weeks of student teaching, each trainee's instructional competencies are assessed. Eleven generic special education and fourteen mainstream competencies have been identified as being taught in The University of Toledo's undergraduate teacher preparation program[2]. The competencies are measured by a high-inference[3] observation inventory, the Teacher Performance Assessment Instrument (TPAI) (Capie, Anderson, Johnson & Eilett, 1980). This instrument consists of 51 indicators of teaching performance grouped into four sections: Teaching Plans and Materials, Classroom Procedures, Interpersonal Skills, and Professional Standards. The supervisor rates these indicators on a scale of 1-5 based on the presence of certain criteria. For example, a student teacher might receive a rating of 5 on the indicator, "uses procedures which get learners initially involved in lessons," if the following behaviors were observed by the supervisor: (1) helps learners recall past experiences; (2) uses existing interests of learners as a link to new activities; (3) stimulates new interests in activities with techniques such as discrepant events; (4) helps learners understand what they may achieve by participating in the activities.

Through a process which has matched The University of Toledo's special education and mainstream competencies with TPAI indicators (or combinations of indicators), competency scores can be derived from the TPAI ratings. For example, the score for the competency "gives clear directions" is derived from an average of the ratings on four of the indicators from the Classroom Procedures section of the TPAI.

Observational data are collected during two half-hour visits to the classroom and one interview with the student teacher concerning teaching plans and professional standards. During or immediately following each classroom visit, the supervisor assigns ratings to each of the TPAI's indicators, referring to the TPAI manual (Capie, et al., 1980) for specific information regarding the criteria. These numerical ratings are entered into the microcomputer using the "Diagnostic Profile" which produces special education or mainstream competency scores according to the already established scoring key. Because student teachers often demonstrate both strengths and weaknesses in various skill areas, supervisors can use the competency scores to address weaknesses and reinforce strengths.

Attitude toward handicapped pupils. Attitudes are determined by a survey battery which student teachers complete at the beginning of student teaching. The survey, modeled after the work of Warger and Trippe (1982), varies according to the student teacher's area of specialization: mainstream regular education or categorical special education (vision

impaired, hearing impaired, orthopedically impaired, learning disabled, developmentally handicapped, behaviorally disordered, severely retarded). The special education batteries consist of a measure of overall attitude toward pupils in a given categorical area and measures of three subcomponents of attitude: (1) beliefs about the human nature of handicapped students; (2) perceived competency in teaching handicapped students; and, (3) feelings about the disturbingness of behaviors characteristic of handicapped students in specific categorical areas. The regular education battery consists of a measure of overall attitude toward mainstreamed students and measures of three subcomponents of attitude: (1) opinions about mainstreaming; (2) perceived competency in teaching mainstreamed students; and, (3) feelings about the disturbingness of behaviors characteristics of mainstreamed students (a composite list of several behaviors from the different categorical areas). Both reliability and validity for the various components of the survey batteries have been established (see Warger and Aldinger, 1984, for further information).

Pupil problem behavior. During their first days of student teaching, trainees are asked to identify a handicapped pupil who demonstrates a learning or behavior problem. Frequency counts for off-task, out-of-seat, disruptive verbal, or physically destructive behavior are recorded during five separate 10-minute observations. The observations occur over several days. The "Diagnostic Profile" scores are entered directly from the five observation forms and becomes the data base for graphs which indicate the number of incidences and overall time ratios for each type of behavior. In addition, the setting (e.g., seatwork, lecture) and type of activity (e.g., math, social studies) are noted for each observation and this information is displayed adjacent to the graphs. The pupil baseline information can be used in several ways by the supervisor. Reference to a pupil problem can, in an indirect and nonthreatening way, lead to discussion of skill or attitude problems shown by the student teacher. The baseline information also can point to contextual factors in the classroom which make the demonstration of certain competencies problematic.

Running the "Diagnostic Profile"

The "Diagnostic Profile" is a menu-driven program written in Applesoft Basic (See Figure 1 for exemplary menu). The program is easy to use and no previous experience with computers is required. The "Diagnostic Profile" must be used on a 48K Apple II series microcomputer equipped with standard 40 column display and at least one disk drive. Use of a printer is optional.

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SPECIAL ED TEST MENU

(1) SEMANTIC DIFFERENTIAL

(2) PHILOSOPHY OF HUMAN NATURE

(3) DISTURBING BEHAVIOR CHECKLIST

(4) PERCEIVED GENERIC COMPETENCY

(5) OBSERVED GENERIC COMPETENCY (TPAI)

(6) PUPIL BASELINE DATA

(7) RETURN TO MAIN MENU

Figure 1: Exemplary Menu: The "Mainstreaming Diagnostician."

Initially, the program prompts the supervisor to enter the student teacher's name and training area (special or mainstream regular education). If the student is in special education, the supervisor selects the categorical area from the following: learning disabled, behavior disordered, developmentally handicapped, severely retarded, hearing impaired, vision impaired, and orthopedically handicapped. When this information regarding the student teacher has been entered, a menu appears which provides the options of entering scores, viewing results, saving scores, or exiting the program.

Entering scores. If the supervisor chooses to enter data, a new menu appears listing the names of each of the diagnostic measures: competency, attitudinal, pupil baseline. The supervisor selects a specific measure and the screen changes again, this time prompting for the student's scores on individual items of the selected measure. The software program was designed with an error routine which

prevents the microcomputer from accepting data that are out-of-range for a particular measure. After data entry is completed, the data (pre- or posttraining) are scored by the program, and the supervisor is offered a choice of viewing the results or entering data from another measure.

Thus, a supervisor may view the scored results of any measure after entering that particular set of data. However, to ensure that all data have been scored and saved, data from all the measures must be entered prior to exiting the program. A supervisor cannot, for example, enter attitude data, then exit the "Diagnostic Profile", turn off the microcomputer, and finish entering data from other measures at a later time. All pretraining or posttraining data for a specified student teacher must be entered during a single session.

Viewing results. The computer displays both pre- and posttest data for each measure simultaneously on the screen, thereby allowing the supervisor to make comparisons and check for improvements. If the supervisor chooses to view results, scores for each measure are displayed on the screen (See Figure 2 for an example of results). In addition to the video display of scores, a printed copy of results also can be obtained. In both the video and the printed versions, student teacher scores are presented as numeric values, and the value is given a rating such as high, average, low for the competencies, or positive, negative, neutral for specific subcomponents of attitude. Due to screen limitations, both perceived and observed competencies are identified by number. The supervisor must refer to a typed list to match the numbers on the screen with the appropriate generic special education or mainstream regular education competencies.

Saving results and exiting the program. When all data have been entered and the student teacher's diagnostic profile has been examined, the supervisor may choose either to save the scored data so that they may be reviewed again at a later date or to exit the program, thereby erasing all data that were entered. To save results, the supervisor chooses this option from the menu that appears either after data have been entered or scores have been displayed. To retrieve a student teacher's scores once they have been entered, the supervisor loads the "Diagnostic Profile" into the computer and enters the name of the student.

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```
                    TEST 1
              Description of Pupil
                Sex of Pupil F
                Grade Level  6

        Out of Place

Setting         Activity
Testing         Art             I******
Transition      Art             I**
Seatwork        Math            I***
1-on-1          Lang.Arts       I*****
Lecture         Spelling        I*******
                                I----I----I
                                     5    10

Total Out of Place = 23/50 min


                    TEST 2
              Description of Pupil
                Sex of Pupil  M
                Grade Level   6

        Out of Place

Setting         Activity
Lecture         Voc Ed          I*
Lecture         Art             I**
1-on-1          Percept.        I****
1-on-1          Math            I**
Transition      Music           I******
                                I----I----I
                                     5    10

Total Out of Place = 15/50 min
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Figure 2: Example of "Mainstreaming Diagnostician" baseline results for pupil out of place behavior.

Utilizing the "Diagnostic Profile"

The computerized "Diagnostic Profile" software program can serve as a valuable administrative and supervisory tool. The microcomputer provides an efficient means for storing and comparing objective information concerning the skills, attitudes and classroom environments of student teachers. Further, the analysis of this information by the "Diagnostic Profile" enables a university supervisor to more easily

identify and remediate specific skill or attitude deficiencies during the most important and final stage of a teacher preparation program, student teaching.

Administrative functions. Administrators find that the "Diagnostic Profile" can solve several problems related to evaluation and record-keeping. Traditionally, success in the student teaching practicum has been documented through anecdotal reports or informal checklists completed by supervisors and cooperating teachers. As a result, comparisons and analyses of student teacher performance for the purpose of program evaluation have been difficult to make. The "Diagnostic Profile" provides administrators with a formal, systematic way of documenting or certifying that the students graduating from their program actually have the teaching skills and characteristics identified as essential by university faculty. Further, if improvements in pupil problem behaviors occur in classes with student teachers whose skill levels also are high, the university has some evidence that the competencies taught in their program have validity in the field setting.

The "Diagnostic Profile" also aids in program evaluation since the saved data can be analyzed from year to year to detect trends in student teacher performance. If, for example, student teachers score consistently low on a given competency, preservice instruction in that area may be examined, or the relevance of the competency itself may be questioned.

Finally, record-keeping is facilitated by the use of the "Diagnostic Profile." As student teacher performances on competency and attitude measures are stored on disks, data for individual student teachers can be accessed easily. The data profile provides an impressive addition to student teacher portfolios; or it can be used by university personnel as the basis for recommendations.

Enhancing supervision. The "Diagnostic Profile" also facilitates the process of student teacher supervision. University supervisors often depend on their own personal priorities and a few classroom visits to determine the focus of conferences with student teachers. This "hit or miss" type of supervision survives because, within the constraints of a 10-16 week practicum, the systematic collection and analysis of observational data on student teachers is considered too time-consuming a process. However, the "Diagnostic Profile" provides an efficient, objective means for supervisors to determine where, specifically, student teachers need improvement within the range of skill areas or characteristics

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considered essential by the university. Problems identified in the data profile can serve to focus initial discussion during meetings with the student teacher. The profile also can be used to communicate university expectations to student teachers.

Text Notes

[1] The "Diagnostic Profile" was developed by Drs. Aldinger, Guthrie, and Warger for The University of Toledo's Preservice Consultation Project, Grant No. G008301647 from the U.S. Department of Education, Office of Special Education and Rehabilitative Services.

[2] Competencies for teachers of mainstreamed students include the following: identifies learning and behavior characteristics; open communication with students; determines appropriate goals and techniques; interprets background information; use of assessment techniques; use of behavior management techniques; provides a variety of group settings; utilizes volunteers and aids; efficient use of time; task analysis; selects appropriate teaching techniques; reinforces accomplishments; selects or develops remedial materials; and maintains records for referral and communication. Generic competencies for teachers of handicapped students include the following: lessons are developmental; rapport with pupils; determines entering behaviors; uses appropriate methods and materials; reinforces achievement; reinforces desirable behavior; evaluates pupil performance and instruction; teaches for transfer and generalization; application of theoretical knowledge; cooperation with parents, school, community; and implements special education legal procedures. For each competency area, numerous subcompetencies also have been identified.

[3] High-inference refers to the process by which the supervisor rates teacher performance. Based on professional judgment concerning a teacher's demonstration of certain behaviors or criteria, the supervisor *infers* that a given competency is being performed at a certain level.

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HELPING PRACTITIONERS UTILIZE MICROCOMPUTERS: THE BOWLING GREEN STATE UNIVERSITY EXAMPLE

Charlotte Scherer, Ph.D.
Bowling Green State University

Abstract

At Bowling Green State University, microcomputers have been incorporated into teacher education clinical experiences and existing coursework. This has aided students and faculty in obtaining computer knowledge without adding numerous courses to an already crowded curriculum. Incorporation of clinical experiences also has had a "ripple effect" of facilitating computer usage in area schools.

Faculty in colleges of education have used different approaches for acquiring the necessary knowledge of and experience with microcomputers. Teacher educators in the College of Education at Bowling Green State University have found that incorporating microcomputer usage in the Clinical Experiences Lab not only led to increasing computer knowledge by faculty and students, but also facilitated computer usage in several area schools. Currently, the Lab houses nine Apple IIe's, seven additional Apples, several printers, and one microcomputer interactive with video tape. What follows is a description of three success stories which emerged from Bowling Green State University's efforts.

Computerized Flanders Research Project

The computerized Flanders clinical experience, originally conceived by Dr. JoAnne Martin-Reynolds, enables the use of Flanders' Interaction Analysis (Amidon and Flanders, 1967) to evaluate the teaching of preservice and inservice teachers. The necessity of completing rather lengthy calculations to analyze and interpret the collected data for this instrument always has been somewhat discouraging to both preservice and inservice teachers. To solve this problem, a project was undertaken which utilized the microcomputer for calculating and analyzing results.

With the aid of the Lab's computer programmer, the Flanders system was computerized and a tutorial was written for Apple II's to help with interpretation (Martin-Reynolds, Besten, and Scherer, 1984). In fact, preliminary results of an ongoing research project conducted by this author and Dr.

Martin-Reynolds suggest that the computerized Flander's program is more time efficient and that use of the tutorial leads to a more thorough evaluation. Due to these positive results, area teachers have been trained to use this program for evaluating their own teaching. Thus, the university has extended its impact on microcomputer education by providing practicing teachers with an efficient means for self evaluation.

Lab Sponsored Microcomputer Course

Area school Administrators took a course wherein a variety of software packages were demonstrated in the Microcomputer Lab. In the course, these administrators learned to use programs for scheduling and grade reporting. They also learned to use such packages as Appleworks for the Apple IIe for general database, word processing, and spreadsheet development (Lissner, 1983).

As a result of taking the course, several administrators now are considering adopting these computer packages for use in their offices. Thus, the "ripple effect" that took place resulted from a university faculty member assisting school administrators to learn about microcomputers in a very practical way. Skills learned in the course were taken directly back to the administrators offices, where they were put to immediate use.

Sharing Effective Microcomputer Software

From the beginning, the Lab has provided faculty with a variety of software for use in their teaching. One program, the Mastery Management System (Boody, 1983), allows individual teachers or an entire school system to define course objectives designed to support objective-based instruction, competency-based instruction, and mastery learning approaches. Comprehensive evaluations of achievement testing can be made easily with the program. When one area school district became interested in adopting the Mastery Management software, the Lab Director arranged for a university faculty member currently using the system to give a presentation of its effectiveness. This presentation influenced the school district to accept the software. Presently, the Mastery Management system is being implemented system-wide.

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Conclusion

Universities can affect school systems. As was shown in this article, efforts to incorporate microcomputers at the preservice level can lead to increased and innovative uses at the inservice level as well. It is critical that teacher educators continue to share their developing microcomputer expertise with school system personnel.

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Dr. Scherer is Director of the Learning Laboratories at Bowling Green State University.

BECOMING COMPUTER LITERATE: PRACTICAL SUGGESTIONS FOR TEACHER EDUCATORS

Gene R. Cupp, Ph.D.
Hiram College

Abstract

Becoming computer literate requires time and effort. The novice microcomputer user often is overwhelmed, if not mystified, as to how to obtain necessary skills and knowledge. This paper presents practical suggestions for teacher educators committed to developing microcomputer expertise.

Advances in information technology, including the use of microcomputers, are evident everywhere. Just how these factors will affect education is not yet completely clear. However, it would be unwise simply to wait and see what develops. It would be even greater folly to ignore the prospective changes in education in the preparation of future teachers. There is a critical need for future teachers to become knowledgeable and capable of introducing children at early levels to computers.

Because of busy schedules and crowded curriculum, getting started or becoming involved in microcomputer technology is a concern for many teachers and teacher educators. Knowing what steps to take, and what pitfalls to avoid, often can make the difference in achieving one's goals. The following recommendations, based on both research (Cupp and Pisano, 1982) and personal experience, offer teacher educators practical means for getting and staying involved with microcomputers.

Start-Up Strategies

1. *Scheduling.* Set aside one hour per day to work with computers. Include that time in your schedule just as a class or other commitment. Try not to turn over the scheduled time to other tasks or meetings. Moreover, one hour per day is far better than spending the same amount of time only one or two days per week.

2. *Secure easy access to hardware.* Progress is slow without easy access to the equipment. If your department does not own its own equipment, make arrangements with the media department to reserve equipment and a quiet working space at

specified times. It must be stressed, however, that the optimal learning environment would require a microcomputer in every office; thus, continue to lobby for departmental ownership of machines.

3. *Expanding your skill repertoire.* Each term try one new or modified use of computer technology in a course you are teaching. Make sure the application does not add something new, but rather replaces tasks, assignments, or presentation aids.

4. *Work with children.* Working with children is one of the most relevant activities to encourage microcomputer involvement. Children often provide a remarkable source of ideas and strategies for making microcomputer learning fun. Watching them work also can provide insight into instructional strategies that both foster and hinder learning.

5. *Don't set out to become an expert.* Initially, don't try to learn about computers for the purpose of dispensing knowledge about them. Rather, learn about them for the purpose of becoming a satisfied user. Explore the technology as a hobby rather than as a task.

General Principles for Integrating Microcomputers into Teacher Education Programs

1. *Integrate technology throughout the program.* Computer technology should become an integral part of the educational program rather than isolated in a single course. All faculty members should be encouraged to identify course elements which lend themselves to microcomputer technology.

2. *Do not add anything to courses or curriculum.* Computer technology should replace other course materials or improve upon something that *already* is being done.

3. *Make use of existing resources.* Use the microcomputer resources that exist rather than seeking and waiting for new hardware or software. Inform students about the limitations of existing equipment, as many of them will be faced with similar situations in school systems.

4. *Secure hardware and personnel support.* It is essential that computer equipment be readily accessible to both students and instructors. Also, support personnel must be available, if only via phone, to answer simple questions.

5. *Go slow, start small, but start.* Try out one technique at a time. Do not try to accomplish everything at once. Give yourself ample time for completing tasks.

6. *Use microcomputers in teaching.* It is better to "employ" the technology in teaching teachers rather than to "teach about it". Technology is best learned if it is used and demonstrated in instruction.

7. *Start with experiences, not with a designated curriculum.* Let the curriculum development occur naturally. Don't start by writing the curriculum and then trying it out. It just doesn't work that way.

Guidelines for Working with Students

1. *Develop positive attitudes.* The development of positive attitudes should be the primary measure of success. Be sure to let students share in your enthusiasm for the new learning/teaching tools. Be sure to use interactive computer technology rather than passive types of computer assisted instruction materials or introductions to programming.

2. *Help students keep from falling behind.* There tends to be much frustration when a student falls behind on microcomputer tasks. As the technology can be new and frightening to some students, plan to allow for occasional individualized conferences.

3. *Be flexible in grading and evaluation.* Flexibility and temperance must be exercised in the grading and evaluation of assignments which involve new microcomputer applications. Pressure of an assignment, combined with learning a new computer function, often will lead to problems of anxiety and frustration. When a new computer application is tried in a course for the first time, student successes should be based *only* upon their attempts to try it, not the quality of their skill or products.

4. *Provide for student evaluation input.* Student suggestions are invaluable. Provide the students with evaluation opportunities during and after the implementation phase.

Concluding Remarks

In a relatively short time many applications of microcomputer technology can be introduced. The first step for teacher educators involves starting and not waiting for some future curriculum. In fact, a curriculum may not be needed if the technology is simply used and becomes a part of the existing program. The best way to prepare and to be ready for the future in education is to become involved and make the best use of the present technology. Teacher educators

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can make major contributions by involving themselves and their students with microcomputers.

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Dr. Cupp is Associate Professor of Education at Hiram College.